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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/644,633	08/20/2003	Viktor Koldiaev	88103.0001	7524

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EXAMINER

MONDT, JOHANNES P

ART UNIT	PAPER NUMBER
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2826

DATE MAILED: 04/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/644,633	KOLDIAEV ET AL.	
	Examiner	Art Unit	
	Johannes P. Mondt	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 February 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 and 21-27 is/are pending in the application.
- 4a) Of the above claim(s) 21-24 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 25-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 August 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date. _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

Amendment filed February 1, 2005 forms the basis of this office action. In said Amendment Applicant substantially amended all pending claims 1-9 through substantial amendment of claim 1, cancelled claims 10-20, and added new claims 21-27. Comments on Remarks in said Amendment are included below under "Response to Arguments".

Information Disclosure Statement

Other than the Information Disclosure Statement filed 8/20/2003 and already acknowledged to have been considered with a signed copy of Form PTO-892 enclosed in the previous office action mailed 11/03/2004 no other Information Disclosure Statement has been found in the file to date.

Election/Restrictions

1. The Invention as elected by original presentation and classified in class 257, subclass 288+, and the Invention as newly included by said Amendment through claims 21-24, classified in class 438, subclass 197+, are related as product made and process of making, respectively.
2. The Inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product as claimed can be made by another and materially different process than the process of claim 21, for instance by performing

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an Si_3N_4 deposition process that does not expose said first SiO_2 layer to hydrazine instead of an Si_3N_4 deposition process that does not expose said first SiO_2 layer to ammonia, while, likewise, the product as claimed can be made by another and materially different process than the process of claim 22, for instance by preventing said formation of a nitride-oxide layer that does not expose said first SiO_2 layer to hydrazine instead of ammonia.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

1. Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 21-24 have been withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Drawings

2. Figures 1 and 2 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the

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applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

3. New corrected drawings in compliance with 37 CFR 1.121(d) are required in this application because the drawings are provided only with handwritten numerals.

Applicant is advised to employ the services of a competent patent draftsman outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. ***Claims 1-9*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Fu et al (US 2002/0146879 A1) in view of Gardner et al (6,323,519 B1) and Wolf (ISBN: 0-961672-4-5) (all made of record in the previous office action).

On claim 1: In the third embodiment Fu et al teach a dielectric spacer structure (third embodiment, Figures 13-16, title, abstract and sections [0067]-[0068]), comprising:

a first oxide layer 504 deposited over a top surface of a wafer 500 and abutting a gate structure 501/502/503 (see section [0067] and Figure 13 for "abutting");

a silicon-nitride barrier layer 505 (section [0067]) deposited over said first oxide layer without having a layer of nitrided-oxide formed between said first oxide layer and said silicon-nitride barrier layer, in view of the absence of a thermal treatment or annealing step and in view of the explicit teaching of abutting first oxide layer and silicon-nitride barrier layers 504 and 505, respectively (Figure 16 and [0068]).

Fu et al do not necessarily teach the limitation "a second oxide layer formed over said silicon-nitride barrier layer".

However, it would have been obvious to include said limitation in view of Wolf who teaches the need to apply interlayer dielectric for planarization of gate/source/drain structures for the specific purpose to avoid unwanted steps in the topographic layout, CVD SiO₂ being one of the simplest ways to implement said planarization (see sections 4.4.2.2, p. 208 and 4.4.3, p. 221). *Motivation* to include the teaching by Wolf in the invention by Fu flows at least from the avoidance of poor step coverage of metal lines (cf. Wolf, p. 201) that need to reach the source/drain regions such as 510 ([0067]) in Fu et al (Figure 16).

Finally, the newly added limitation "in order to reduce stress within said dielectric spacer structure caused by nitrided-oxide" constitutes functional language that fails to limit the spacer structure. In this regard Applicant is reminded that intended use and other types of functional language must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the

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intended use, then it meets the claim. In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963).

On claim 2: the dielectric spacer structure as essentially taught by Fu et al, Gardner et al and Wolf further comprises a second silicon nitride layer 506 ([0068]) in the third embodiment, formed between said silicon nitride barrier layer 505, and said second oxide layer (as taught by Wolf), while the further limitations defined by the wordings that said second silicon nitride layer is an "etch stop" layer and "wherein said etch stop nitride layer is formed through a process that includes ammonium precursors" solely constitute limitations on the method of making and not on the structure. Applicant is reminded that it has been held that intended use and other types of functional language must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim, and, being entirely identical in constitution as claimed is capable to achieve the same intended use. See: In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963).

On claim 3: Fu et al at least in their third embodiment teach that atomic layer deposition (ALD) is used for the deposition of the silicon nitride barrier layer. Please note for future reference that ALD is selected so as to improve the hydrogen content in the silicon nitride layer from "reduced" in the LPCVD method of the third embodiment ([0067]) to "substantially absent or without" in the teaching for the third embodiment ([0067]).

In reference to the claim language referring to formation by plasma process as delineated above, intended use and other types of functional language must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. See: *In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963).

On claim 4: the further limitation as defined by claim 4 limits how the dielectric spacer, in particular the silicon-nitride barrier layer is formed, but fails to limit said dielectric spacer structure as it fails to limit said silicon nitride layer. Applicant is reminded that

In reference to the claim language referring to , intended use and other types of functional language must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. *In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto* , 136 USPQ 458, 459 (CCPA 1963).

On claims 5-7: In reference to the claim language referring to formation of said silicon nitride barrier layer through vapor deposition of a nitrogen-silicon gas containing a non-ammonia based organic precursor as defined by claims 5, 6 and 7, intended use and other types of functional language must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed

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invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. See: *In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963). Although Applicant achieves the absence of nitrogen in the underlying first oxide layer by avoiding the use of ammonia, be it through use of organic precursor that does not contain ammonia, or vapor deposition of N_2 and $SiCl_2$, or vapor deposition of N_2 and SiF_4 , in the invention as essentially taught by Fu et al, Gardner et al and Wolf said avoidance is achieved either by making the underlying first oxide layer thick enough or by exposing the oxide layer to vapor in a CVD during a short enough time (see Gardner et al, col. 4, l. 15-28). Hence, indeed no structural difference is necessarily indicated and the intended use of the dielectric spacer structure can be achieved by the invention by Fu et al, Gardner et al and Wolf.

On claim 8: said silicon nitride barrier layer in Fu et al has a thickness of 2 nm – 5 nm in both the third embodiment ([0067]), which substantially overlaps with the claimed range of 1.5 – 3 nm through the portion 2 – 3 nm. Furthermore, the thickness of the second silicon nitride layer by Fu et al corresponding as structure identically to the claimed etch stop layer as explained above is in the range from about 40 – 80 nm ([0068]), which substantially overlaps the claimed range of 30 – 90 nm through the portion 40 – 80 nm.

A *prima facie* case of obviousness typically exists when the ranges of a claimed composition overlap the ranges disclosed in the prior art or when the ranges of a claimed composition do not overlap but are close enough such that one skilled in the art

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would have expected them to have the same properties. See: *In re Peterson*, 65 USPQ2d 1379 (CA FC 2003).

On claim 9: the thickness of the second silicon nitride layer in the third embodiment by Fu et al corresponding as structure identically to the claimed etch stop layer as explained above is in the range from about 40 – 80 nm ([0068]), which substantially overlaps the claimed range of 30 – 90 nm through the portion 40 – 80 nm.

A *prima facie* case of obviousness typically exists when the ranges of a claimed composition overlap the ranges disclosed in the prior art or when the ranges of a claimed composition do not overlap but are close enough such that one skilled in the art would have expected them to have the same properties. See: *In re Peterson*, 65 USPQ2d 1379 (CA FC 2003).

On claims 25-27: the further limitations as defined by claims 25, 26 and 27 all fail to further limit the structure but instead only limit the method of formation, constituting functional language. In reference to the claim language referring to all limitations in claims 25-27 on how said dielectric spacer is formed, intended use and other types of functional language must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. *In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963).

Response to Arguments

Applicant's arguments filed February 1, 2005 have been fully considered but they are not persuasive. In particular, Applicant's traverse of the rejection appears to be based on the claim language only now included through amendment, i.e., "without having a layer of nitrided-oxide formed between said first oxide layer and said silicon-nitride barrier layer in order to reduce stress within said dielectric spacer structure caused by nitride-oxide", stating in Remarks on the three embodiments disclosed in the primary reference Fu (2002/0146879 A1) (see previous office action mailed November 3, 2004) that all "three of these embodiments include the formation of a layer of nitride-oxide between the oxide layer and the silicon oxide layer". This is incorrect: while the first embodiment (see par. [0046] and Figure 3) includes a heating step that produces a nitride oxide layer (see [0063]) no mention of any heating step or any formation of a layer of nitrided-oxide is taught in the cited third embodiment (see Figures 13-16 and [0067]-[0068]). Therefore, the newly added limitation "without having a layer of nitrided-oxide formed between said first oxide layer and said silicon-nitride barrier layer" does not distinguish over the prior art as cited. Furthermore, the newly added limitation on purpose "in order to reduce stress within said dielectric spacer structure caused by nitrided-oxide" constitutes functional language, which fails to further limit the device. In this regard Applicant is reminded that intended use and other types of functional language must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

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See: In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963).

Remarks on Gardner et al are moot in view of the removal of the limitation ad (a) through amendment in the independent claim 1. No comments on the third reference, i.e., Wolf, are included.

In view of the above the rejection of claim 1 can be readily adapted for the newly substantially amended claim language at least when based on one of the originally cited embodiments in Fu, namely the third embodiment.

The rejections made above were based on these considerations.

Conclusion

3. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P. Mondt whose telephone number is 571-272-1919. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J. Flynn can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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JPM
April 1, 2005